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(54) Contact lens cleaners

(57) A method for cleaning contact lenses comprises contacting the lenses with an active electrophilic cleaning material which promotes wetting. The material may be a particulate hydrophilic material in a liquid, or in the form of a partly-hydrated hydrophilic pad impregnated with surfactant solution. The hydrophilic material may be polyacrylimide, polyvinyl pyrrolidone or polyvinyl alcohol.

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SPECIFICATION

Contact lens cleaners

- 5 Contact lenses used in daily and extended wear are of three main types, i.e. (1) rigid polymethyl methacrylate; (2) rigid gas-permeable (RGP) containing various mixtures of silicone styrene and fluorocarbons; and (3) fully hydrophilic soft materials. Type 1 materials have been in use, requiring only minimal cleaning systems, for many years. Type 3 hydrophilic systems are characterised by the ability to take in water in two ways, i.e. (a) as bound water more or less firmly attached to chemically-active hydrophilic sites on the molecular chains, and (b) as free moisture dispersed within the interstices of the molecular structure.

- 20 Type 2 materials are not innately hydrophilic and, as such, suffer from poor surface wetting with consequent poor visual acuity and poor comfort. In an attempt to overcome these problems, and to promote good wettability, a small proportion of hydrophilic sites is incorporated on the surface of such RGP materials. Thus, although RGP's do not contain free water, the mechanism of surface wetting and thus the mechanisms of surface contamination are in many ways comparable to those operating in soft hydrophilic systems.

- Surface contamination of the lens can occur as the result of the build-up of cosmetics, mucoproteins and other cellular debris. While the full process is complex and not yet fully understood, it is clear that some part of the mechanism involves the displacement of water from the electrophilic binding sites and its substitution by water-miscible proteins at these surface sites.

- 40 Cleaning systems currently used with RGP materials employ simple detergent systems, to dissolve and remove debris, or inert abrasives, e.g. aluminium oxide, cerium oxide or pumice, either in water or in a detergent system (as above), to aid the removal of contaminants by friction. The abrasives are too harsh, mechanically, for use with soft hydrophilic materials; therefore, detergent systems only are used for them.

- 50 A contact lens cleaner according to the present invention comprises an active electrophilic cleaning material, e.g. a material containing surface active sites of a similar nature to those present throughout the body of soft hydrophilic materials and on or in the surfaces of RGP materials (to promote wetting). In particular, contact lenses are cleansed by contact with a combination of a hydrophilic material and a suitable (usually polar) liquid. In use of such a cleaning material, the electrophilic attraction of the sites built into the active cleaning competes with the sites on the lens surface, to attract and hold any contaminant which is present.

The active material may include, for example, electro-active sites on or in the surface of solid particles of the abrasive phase of a liquid cleaner. By way of illustration, powdered hydrophilic material is used as the abrasive phase in a detergent liquid, to form a cleaner of a conventional type, but of improved performance.

- 70 Alternatively, the cleaner is in the form of a partly-hydrated hydrophilic pad impregnated with surfactant (detergent) solution. If desired, such a pad may be provided with a rough surface, specifically to aid cleaning by abrasion.

- 80 It has been found that hydrophilically-active abrasive systems improve the primary removal of contaminants. This effect is presumably caused by electrophilic attraction of the dirt particles from the lens surface (competition), in addition to the known method of abrasion and detergency. Such systems are particularly suitable for RGP materials.

- 85 The use of partially hydrated hydrophilic materials as pads or as a distribution of particles in a liquid base has the effect of a "soft" abrasive. This is less damaging to the surface being cleaned than a simple hard abrasive, and has been found suitable for use with soft hydrated hydrophilic materials.

- 90 A liquid cleaner of the invention may be prepared by adding, to 100 parts by volume of a surfactant solution (Biogel Cleaner N is particularly effective), between 0.01 and 60 parts by volume of a powdered hydrophilic material of appropriate particle size and size distribution chosen to optimise simple abrasion. A wide range of hydrophilic materials is suitable, including polyacrylimide, polyvinylpyrrolidone and polyvinyl alcohol.

- 100 Specifically, a 5% by volume suspension of dry hydrophilic material based on methyl methacrylate and N-vinylpyrrolidone (characterised by a water uptake of 75%) of mean particle size 50 μm , suspended in a mixture of non-ionic detergents (Biogel Cleaner N) has been found to be effective.

- 110 An example of an active cleaner for hydrophilic materials is as above, the hydrophilic particles are pre-softened by partial hydration with water or another suitable plasticiser, e.g. glycerol or alcohol.

- 115 A cleaner pad of the invention may consist of a disc of suitable hydrophilic material (for example a 75% moisture content hydrophilic polymer based on methyl methacrylate and N-vinylpyrrolidone), partially but not necessarily completely hydrated and softened with water, a suitable detergent system or a non-aqueous material such as glycerol, or a water-alcohol mixture. The resulting soft pad may additionally be surface-roughened, to enhance its abrasive effect. The pad is rubbed against the surface to remove contamination.

1. A method for cleaning contact lenses, which comprises contacting the lenses with an active electrophilic cleaning material which promotes wetting.
- 5 2. A method for cleaning contact lenses, which comprises contacting the lenses with a combination of a hydrophilic material and a liquid.
3. A method according to claim 2, in
- 10 which the liquid is polar.
4. A method according to claim 2 or claim 3, in which the liquid is a surfactant.
5. A method according to any preceding claim, in which the material is a particulate
- 15 hydrophilic material.
6. A method according to any of claims 1 to 4, in which the material is in the form of a partly-hydrated hydrophilic pad impregnated with surfactant solution.
- 20 7. A method according to any preceding claim, in which the lenses are rigid gas-permeable lenses.
8. A method according to claim 1, substantially as herein described.
- 25 9. A composition suitable for cleaning contact lenses, which comprises particulate hydrophilic material in a surfactant liquid.
10. A pad suitable for cleaning contact lenses, which is of a partly-hydrated hydro-
- 30 philic material impregnated with surfactant solution.

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